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The Economic and Fiscal Impacts of The Hawaii Energy Conservation Income Tax Credit

(Revised from January 27, 1997)

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EXECUTIVE SUMMARY

The overall objective of this research is to assess the impact to the State of Hawaii of the Energy Conservation Income Tax Credit (ECITC). Before presenting the overall conclusions related to this objective, it is important to note that the decision to purchase a solar system is an investment decision. This means that a solar system provides benefits for its entire life (25 years) as opposed to the year of its purchase only. The analysis is performed on this basis. Thus, the economic and fiscal impacts (benefits less costs to the economy and State government) of purchasing a solar system do not end the year of its purchase. Rather, they continue for the life of a solar system. Initial and subsequent year solar systems have cumulative impacts to those generated by systems installed in previous and subsequent years.

ASSUMPTIONS

Important research assumptions are the following.

1. The benefit of the ECITC is the stimulus this expenditure provides to an individual to purchase a solar system and this purchase's consequent economic and fiscal impacts.

2. The cost of the ECITC is the economic and fiscal impacts foregone due to reduced purchases of fossil fuel-generated energy to heat water caused by the purchase of a solar system.

3. The cost if the ECITC is eliminated is the economic and fiscal impacts foregone due its elimination including any direct fiscal expenditures (*i.e.* unemployment insurance).

4. If the ECITC is eliminated the electric utility Demand Side Management (DSM) program is eliminated as well.

MAJOR RESEARCH CONCLUSIONS

The major research conclusions are the following.

1. The ECITC serves as a market signal to consumers that stimulate investment in solar systems. The number of solar systems purchased would decrease by 90% if the ECITC is eliminated. This effect could be due to economic, informational and/or behavioral factors.

2. The effective year one cost to the State of the ECITC is the value of the credit refunded to the purchaser of a solar system of $1,327 less tax revenues generated from the purchase of a solar system of $999. The effective year one cost is $527, which is 40 percent of the value of the ECITC refunded to a solar system purchaser. There is no ECITC expenditure for the 17% of all solar system purchasers who do not claim the credit.

3. With the ECITC (*i.e.* the status quo is maintained), there is a positive fiscal impact to the State over the life of a solar system purchased of $1,842 per system. This is due to an average annual positive expected fiscal impact of a solar system of $99 per year from years 2-25 of the life of a system. This positive net fiscal impact is due to the energy savings from solar systems the value of which is exogenous to Hawaii's economy.

4. The net fiscal impact of each system purchased with no ECITC claim is a positive $3,169. The number of these system purchases, the majority of which are military installs, would decrease if the ECITC were eliminated due to the simultaneous elimination of the utility DSM rebate program.

5. The ECITC employment impact over the life of a solar system is positive. That is, by stimulating investment in solar systems, the total State ECITC expenditure increases the total number of jobs in the state. For year 1 the increase in total jobs is a net of about 1 job per 13 solar systems installed. The average annual increase in total jobs for years 2-25 is 1.5 jobs per solar 100 systems installed. Correspondingly, labor income increases due to the ECITC.

6. If the ECITC is eliminated and the solar industry shrinks to 10% of its current 2,764 systems installed per year size, the State will suffer a net fiscal loss of approximately $3,165 per solar system in year 1. First year losses are primarily due to fiscal expenditures in the form of unemployment compensation the State would incur due to a decrease in total jobs caused by the elimination of the ECITC. There is also a negative revenue effect in year 1 of $800. Year 2-25 negative fiscal impacts are due to the loss of the positive fiscal impacts of a solar system over this period as well as possible continuing unemployment compensation or other fiscal costs due to a solar industry size decrease.

OTHER RESEARCH CONCLUSIONS

Other research conclusions are the following.

1. The (net) total State ECITC expenditure for the estimated 2,764, 83% of whom claim the credit, is negative $0.3 million in year 1. The average annual fiscal impact of the ECITC in years 2-25 of these systems is positive $0.24 million per year, such that the overall fiscal impact over the life of systems purchased in a given year is $5.6 million.

2. The job impact of systems installed in a given year at the current credit level is 194 jobs in year 1 and an annual average of 38 jobs for years 2-25. Year 2-25 impacts are cumulative to impacts from systems installed previously and those expected to be installed in subsequent years.

3. If the ECITC is eliminated, the State is estimated to incur direct fiscal expenditures in the form of unemployment insurance costs in excess (by $7.5 million) of the cost of the ECITC the assumed year of its elimination. Direct fiscal costs could continue after year 1 if workers who lose their jobs due to the elimination of the ECITC are unable to find alternative jobs in the period assumed for this analysis (16.6 weeks). Such costs are "avoided" by not eliminating the ECITC. The elimination of the ECITC also leads to a reversal of the positive net revenue impacts caused by the ECITC after year 1 becoming negative $0.91 million in years 2-25.

4. An oil price real rate of increase (decrease) of 1.4% (-1.7%) relative to the base case 0.2% expected increase causes a 25% (-30%) increase (decrease) in the net fiscal benefits and employment effect of the ECITC.

5. The value of tangible and intangible impacts of the ECITC not included in the analysis would have positive economic and fiscal impacts. This is primarily due to "avoiding" the cost of negative externalities associated with burning fossil fuels. The costs associated with these negative externalities are "avoided" due to reduced fossil fuel use brought about by the ECITC. The quantification of these costs "avoided" by the ECITC is beyond the scope of this analysis. They are of particular relevance to Hawaii, however, given the inter-relationships between economic development, especially tourism, the environment and energy use.

ANALYSIS DISCUSSION

INTRODUCTION

The objective of this research is to assess the impact to the State of the Energy Conservation Income Tax Credit (ECITC) on behalf of the Hawaii Solar Energy Association and the Energy Task Force. This entails assessing economic and fiscal impacts in the form of costs and benefits caused by the ECITC. These impacts are estimated using the State of Hawaii 1992 Input/Output model published by the State Department of Business, Economic Development & Tourism (DBEDT). How this is done and the results from performing the assessment are presented in the sections below. These results provide the basis for the various conclusions drawn from this research presented in the Executive Summary.

THE SOLAR SYSTEM PURCHASE DECISION

The decision to purchase a solar system is an investment decision as opposed to a consumption decision. This means that once purchased, a solar system produces benefits over its 25-year useful life. Thus, the economic impacts of purchasing a solar system do not end the year of its purchase, they continue for the life of the system.

Viewing the purchase of a solar system from an investment perspective, Table 1 shows that the purchase of a solar system without the ECITC provides an average annual rate of return ranging from 12.3 percent to its purchaser. This rate of return is due to the annual energy cost savings a solar system provides over its life. In spite of such a favorable economic signal, the number of systems purchased in Hawaii is largely a function of the existence and size of the total tax credit. This could be due to economic reasons as the ECITC improves the economic return to the system purchaser. The ECITC could also be an informational factor (*e.g.* purchasers do not know or become aware of the benefits of a solar system without the ECITC) and/or behavioral factor (*e.g.* purchasers are motivated by ECITC tax savings for reasons related to tax savings themselves and/or support for State energy policy as embodied in the ECITC) affecting purchase decisions. Whatever the reason, the ECITC serves as a market signal to consumers stimulating investment in solar systems.

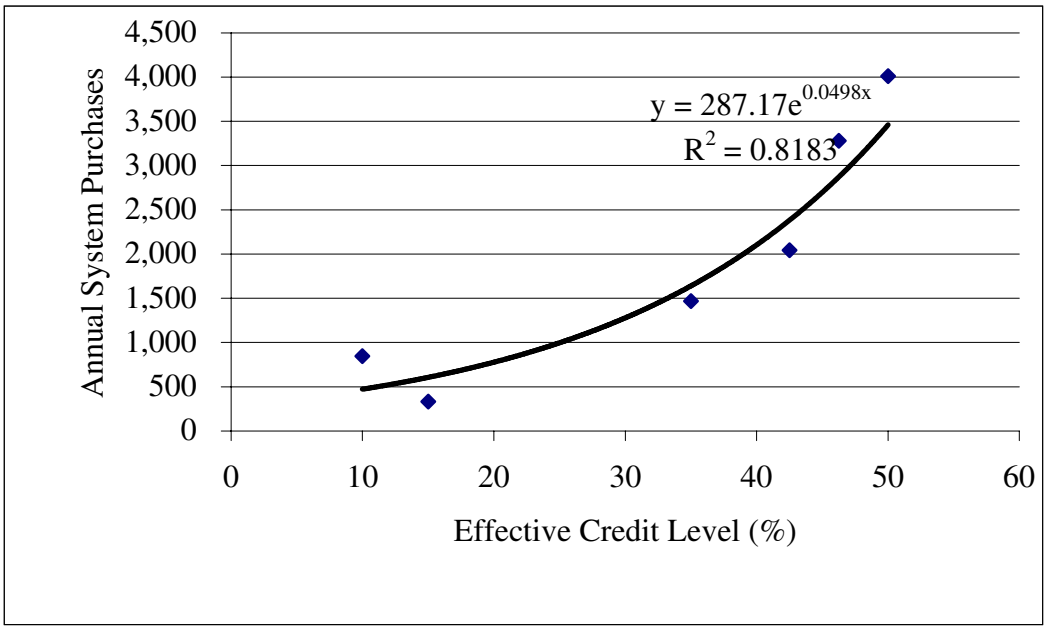
Table 1: The Investment Performance of a Solar System (assumed cash purchase)

Item	No ECITC	With ECITC
Investment Payback (years)	9	5
Net Present Value	$2,359	$4,300
Internal Rate of Return	12.3%	28.9%

The Relationship Between Credit Levels and Solar Systems Purchased

Chart 1 supports the conclusion just noted. It shows the estimated relationship between the size of the effective tax credit and the number of solar systems purchased in Hawaii, which increases with the size of the effective credit.

Chart 1: The Relationship Between the Size of the Credit and Statewide Solar System Purchases



Source: report p. 21

Using Chart 1 results, the expected annual number of solar system purchases is:

- 287 if there is no credit,
- 1,641 if there is an ECITC credit of 35% but no DSM rebate, and
- 2,764 if there is an ECITC with the current DSM rebate which provides an effective credit of 45% of the purchase price at the current ECITC and rebate levels.

These results suggest a reduction in the number of systems sold of 2,477 or 90% if the ECITC and DSM program are eliminated.

ECONOMIC AND FISCAL IMPACTS OF THE ECITC

Economic impacts are changes in output, employment and labor income in the general economy. Fiscal impacts are changes in government expenditures and revenues. Economic and fiscal impacts measured in this analysis are caused by the State government's expenditure on the ECITC or the elimination of the ECITC.

Expenditure Pattern Changes Caused by the Purchase of a Solar System

Purchase of a solar system changes expenditure patterns of the purchaser. Specifically, if a solar purchase is made, the purchaser either purchases the solar system with cash from savings (cash purchase) or from borrowed moneys (system financed). Once installed, the solar system requires preventative maintenance and part replacement costs over its life. Solar systems reduce energy costs thereby freeing money for alternative consumption expenditures. This energy cost savings can be spent on other goods and services, the assumption of this analysis. Since any energy cost savings is an exogenous impact, there are no offsets to this spending.

This expenditure pattern change causes economic and fiscal impacts. An increase (decrease) in the size of the solar industry due to the elimination or expansion of the ECITC increases (decreases) the economic and fiscal impacts. This includes economic and fiscal impacts caused by changes in the level of oil imports.

The Solar System Purchase Decision and ECITC Benefits and Costs

The benefit of the ECITC is the stimulus it provides to an individual to purchase a solar system and this purchase's consequent economic and fiscal impacts. The cost of the ECITC, are the economic and fiscal impacts of purchasing fossil fuel-generated energy to heat water *foregone* due to the purchase of a solar system. Benefits less costs indicate the net impact of the ECITC. There are also benefits and costs related to the DSM rebate program the existence of which is assumed contingent upon the existence of the ECITC.

If the ECITC were eliminated, other economic and fiscal costs would be incurred for each system not purchased because there is no ECITC and DSM program. These include output, employment and labor income decreases and their consequent impact on State tax revenues, and direct fiscal expenditures to the State in the form of unemployment insurance benefits. Costs could also include other expenditures due to temporary and possible permanent unemployment caused by a size reduction of the solar industry due to ECITC elimination.

Net Impact of the ECITC – Case 1

Table 2 shows ECITC benefits and costs and the ECITC impact (*i.e.* benefits less costs) for the first year and the average annual impact for years 2-25, for the base case scenario for Case 1. Case 1 is the status quo situation where solar system purchasers receive a tax credit (*i.e.* the ECITC) from the State and DSM rebate the year the system is purchased. Of the estimated annual total number of systems purchased, 83% claim the ECITC. Purchasers not claiming the ECITC yet obtain the DSM rebate.

For Case 1, benefits equal the economic and fiscal impacts of the purchase of a solar system caused by the ECITC. Costs equal the economic and fiscal impacts due to fossil fuel-generated energy purchases to heat water *foregone* due to the purchase of a solar system. The base case scenario assumes the solar system is purchased is 100% financed, the purchaser receives a $728 rebate, and real annual increases in energy costs of 0.2% for the life of the system.

Table 2: Economic and Fiscal Impacts of a Single ECITC Stimulated System Purchase

	Benefits		Costs		(Benefits Less Costs)		
Item	Year 1	Avg/Yr Years 2-25	Year 1	Years 2-25	Year 1	Avg/Yr Years 2-25	TOTAL
Economic Impacts							
Total Output	$10,657	$843	$2,735	($704)	$7,922	$1,546	**$45,032**
Employment	0.133	0.011	0.055	(0.004)	0.078	0.015	
Total Labor Income	$4,368	$299	$1,693	($162)	$2,675	$461	**$13,742**
Fiscal Impacts							
Total Revenues	$999	$47	$199	($51)	$800	$99	**$3,169**
Total Expenditures							
ECITC Expenditure	$1,327	$0	$0	$0	$1,327	$0	**$1,327**
Direct Fiscal Expend.	$0	$0	$0	$0	$0	$0	**$0**
NET FISCAL IMPACT	($328)	$47	$199	($51)	($527)	$99	**$1,842**

Source: Report pp. 12-14 and 17-18

Table 2 shows purchase of a solar system has positive economic impacts (*i.e.* output, employment and labor income impacts). That is, the economic benefits of the ECITC expenditure are greater than the economic costs of a solar system purchased with the ECITC. Specifically,

- Economic output stimulated by the purchase of a solar system increases $8 thousand in year 1 and an average of $1.5 thousand per year for years 2-25;
- 7.8 total jobs per 100 solar systems installed are generated in year 1 and an average of 1.5 jobs per year per 100 solar systems purchased from years 2-25 of the life of these systems;

- Over $2.6 thousand labor income is generated in year 1 and an average of $461 from years 2-25.

Table 2 shows a negative net fiscal impact to the State (*i.e.* revenues less than expenditures) in year 1 of $527 for Case 1. The net fiscal impact to the State is less than the $1,327 ECITC amount due to the fact that net revenues generated by ECITC stimulated solar system purchasers are $800 in year 1. Net revenues in years 2-25 average $99 per year. In total, the net fiscal impact to the state over the life of a solar system is $1.8 thousand.

Net Impact of the ECITC Elimination – Case 2

Table 3 shows benefits and costs for the first year and years 2-25, for the base case scenario for Case 2. Case 2 is the situation where the ECITC is eliminated. Estimated benefits and costs for Case 2 are the opposite of Case 1 with two changes. First, the ECITC expenditure is eliminated. Second, a fiscal expenditure of $1,828 unemployment compensation per system not installed due to the elimination of the ECITC is assumed incurred by the state the year the ECITC is eliminated and $154 years 2-25 due to the loss of jobs, job creation and assumed consequent fiscal costs caused by the ECITC elimination. This expenditure is assumed spent as unemployment compensation income on personal consumption.

In contrast to Case 1, Table 3 shows that for Case 2, each of the positive economic impacts becomes a negative impact. This is because the economic benefits foregone due to the existence the ECITC are greater than the economic costs saved due to its elimination.

Table 3: Economic and Fiscal Impacts per Solar System Not Installed Due to the Elimination of the ECITC

	Benefits		Costs		(Benefits Less Costs)		
Item	Year 1	Avg/Yr Years 2-25	Year 1	Avg/Yr Years 2-25	Year 1	Avg/Yr Years 2-25	TOTAL
Economic Impacts							
Total Output	($10,657)	($843)	($2,194)	$1,714	($8,463)	($2,557)	($95,391)
Employment	(0.133)	(0.011)	(0.050)	0.014	(0.083)	(0.025)	
Total Labor Income	($4,368)	($299)	($1,490)	$542	($2,878)	($841)	($31,470)
Fiscal Impacts							
Total Revenues	($999)	($47)	($160)	$125	($839)	($172)	($6,696)
Total Expenditures							
ECITC Expenditure	$0	$0	$0	$0	$0	$0	$0
Direct Fiscal Expend.	$2,326	$196	$0	$0	$2,326	$196	$9,004
NET FISCAL IMPACT	($3,325)	($244)	($160)	$125	($3,165)	($369)	($15,700)

From a fiscal impact perspective, it is important to note that:

- The effective cost of the ECITC (Case 1) is $524 in year 1, or 40 percent of the ECITC paid to the purchaser of a solar system the year the credit is claimed. This cost is more than compensated for over the life of a solar system due to the net positive fiscal impacts of a solar system after year 1 such that at the State reaps a positive return to its investment.
- If the ECITC is eliminated, the negative net fiscal impact to the State is more than 6 times larger the year the ECITC is eliminated.
- The level of the negative fiscal impacts after year 1 if the ECITC is eliminated (Case 2) depends on the capacity of economy to generate jobs for workers who otherwise would have been employed by an ECITC supported solar industry and the output and labor income level of replacement jobs.

TOTAL ECONOMIC AND FISCAL IMPACTS OF THE ECITC

Total economic and fiscal impacts of the ECITC are calculated by multiplying the per system impacts shown in Tables 2 and 3 by the marginal number of system purchases related to the ECITC (Case 1) or, stated otherwise, which are not purchased because the ECITC is eliminated (Case 2). The product for the ECITC cost is multiplied by the percentage of purchasers who claim the ECITC to account for non-ECITC purchases. Based on the relationship between solar system purchases and the effective credit level shown in Chart 1, the estimated marginal number of solar system purchases related to the ECITC based on the current effective credit level of 45% is 2,477. The number of solar systems purchases related to the effective credit level will increase (decrease) due to an increase (decrease) in either the ECITC and/or DSM rebate levels according to the relationship shown in Chart 1. Table 4 shows the total economic and fiscal impacts of the ECITC for cases 1 and 2.

Table 4: Total Economic and Fiscal Impacts of the ECITC

	Benefits less Costs (millions of dollars)					
	Case 1			Case 2		
Item	Year 1	Avg/Yr Years 2-25	Total	Year 1	Avg/Yr Years 2-25	Total
Economic Impacts						
Total Output	$19.6	$3.83	$111.5	($21.0)	($6.33)	($172.9)
Employment	194	38		(207)	(62)	
Total Labor Income	$6.6	$1.14	$34.0	($7.1)	($2.08)	($57.1)
Fiscal Impacts						
Total Revenues	$2.0	$0.24	$7.8	($2.1)	($0.427)	($12.3)
Total Expenditures						
ECITC Expenditure	$2.2	$0.00	$2.2	$0.00	$0.00	$0.0
Direct Fiscal Expend.	$0.00	$0.00	$0.0	$5.8	$0.49	$17.4
NET FISCAL IMPACT	($0.3)	$0.24	$5.6	($7.8)	($0.91)	($29.8)

Source: Tables 2, 3 and Chart 1

Year 1 and Years 2-25 Average Annual Impacts For Cases 1 and 2

Table 4 shows the following related to year 1 and years 2-25 average annual impacts for cases 1 and 2.

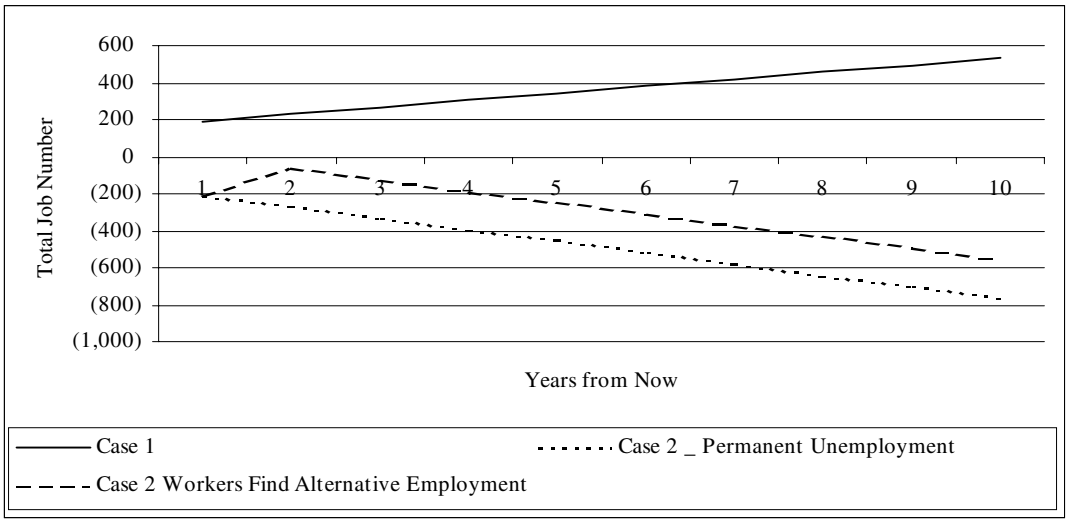
- The total employment effect of the ECITC is 194 total jobs for annual system installation of 2,477 systems and an average of 38 total jobs created each year the ECITC exists (Case 1) related to service and maintenance of systems installed in a given year. Employment effects are foregone if the ECITC is eliminated (Case 2).
- The labor income effect of the ECITC is $6.6 million per year for annual system installation of 2,477 systems and an average of $1.14 million labor income for systems installed in a given year for a total of $34 million over the life of the systems (Case 1). This labor income effect is foregone if the ECITC is eliminated (Case 2).
- The Case 1 net total fiscal impact of the ECITC is negative $0.3 in year 1 and positive $0.24 million in years 2-25 for a total fiscal impact of positive $5.6 million due to the ECITC for a given year's purchase of 2,477 systems. For Case 2, the year 1 fiscal impact of the ECITC is negative $7.8 million for the 2,477 not purchased due to the elimination of the ECITC. The total average annual fiscal impact for years 2-25 for Case 2 is negative $0.91 million for an overall impact of negative $29.8 million.

Cumulative Job and Fiscal Impacts For Cases 1 and 2

The cumulative job effects are shown in Chart 2. It shows that the ECITC has a significant total job effect relative to not having the ECITC (i.e. Case 2). This relative effect is significantly

greater if one assumes that the installation jobs lost due to the elimination of the ECITC result in permanent unemployment as Chart 2 shows.

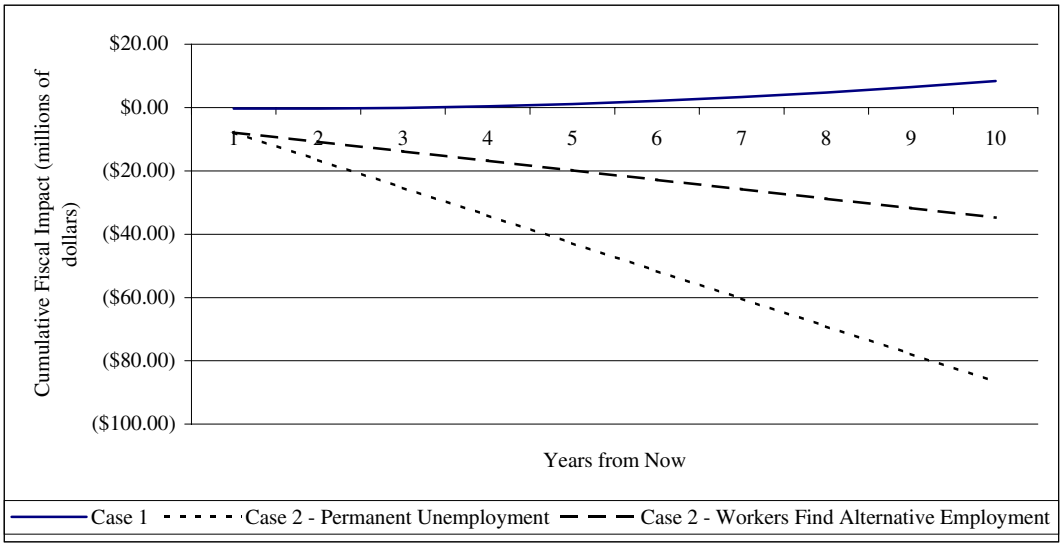
Chart 2: Case 1 and 2 Cumulative Total Job Effects



Source: Table 4

The cumulative fiscal impacts are shown in Chart 3. It shows that fiscal impacts of the ECITC (i.e. Case 1) are increasingly positive in contrast to the increasingly negative fiscal impacts caused by ECITC elimination (i.e. Case 2). This relative effect is significantly greater if one assumes that the installation jobs lost due to the elimination of the ECITC result in permanent unemployment as Chart 3 shows.

Chart 3: Case 1 and 2 Cumulative Total Fiscal Impacts



Source: Table 4

Impact Changes Due to Base Case Scenario Assumption Changes

The results presented in Tables 2 and 3 are for the base case scenario. As noted, the base case scenario assumes that the solar system purchase is financed, the purchaser receives a $728 rebate from the electric utility via the Demand Side Management (DSM) program and oil costs increase at a real average annual rate of 0.2% over the life of a solar system. Altering any of these assumptions alters the estimated economic and fiscal impacts of the ECITC. The changes discussed below are made relative to the base case scenario.

System Financed versus Purchased with Cash: If a system is financed rather than purchased both the overall economic and fiscal impacts remain approximately the same as the cash purchase situation. However, the year 1 negative fiscal impact is greater than a financed purchase where as year 2-25 positive fiscal impacts are greater. Likewise, year 1 positive economic benefits are deferred to years 2-25 from year 1.

DSM Rebate of $1000: If the DSM rebate is $1000 for Oahu retrofits, or the same as the DSM rebate level for new Oahu systems and system purchases on neighbor islands, the economic and fiscal impacts improve by 25-30% relative to the current $500 rebate level.

Oil Prices: High (low) oil price changes increase (decrease) economic and fiscal economic impacts of the ECITC by 25% (-30%).

Economic and Fiscal Impacts Not Measured

Tangible economic and fiscal impacts of the ECITC not measured in this analysis include the following.

1. The negative impact on Hawaii's position as a Pacific Basin energy development and implementation leader. This leadership position is exemplified by the fact that Hawaii has the highest state per capita number of solar systems in the nation and HECO's receipt of the prestigious Edison Award in 1994 for its heat pump water heating system program. This negative impact could have long-term negative impacts on potential export revenues due to reduced involvement of Hawaii's solar industry (due to its reduced size) in the Pacific Basin.

2. The negative impact on business investment in Hawaii due to vacillating state policy, which reduces business environment certainty, and thus investment. This is of particular relevance and veracity for various solar industry members who have forestalled expansion plans on Oahu and the neighbor islands due to the threat the ECITC will be eliminated.

3. The negative impact of direct fiscal expenditures if the ECITC is eliminated that would be incurred by the State in addition to those measured in this analysis (*i.e.* unemployment insurance costs). These include: potential welfare benefit expenditures to displaced workers, expenditures for direct State involvement in retraining programs for new jobs or direct subsidies for new job creation, and revenue losses to the State due to private sector expense increases to re-train workers for new jobs and for the creation of new jobs.

4. Positive ECITC fiscal impacts to Hawaii counties in the form of permit fees and increased property tax revenues.

5. The option value (*i.e.* the value of having a solar industry of its current size) lost to the State given solar industry downsizing if the ECITC is eliminated.

Intangible ECITC economic and fiscal impacts arise due to positive externalities (side effects) from reduced oil consumption brought about by the ECITC. These are reduced air, land and water pollution and attendant problems including global warming and acid rain. If the cost of these negative consequences of burning fossil fuels were incorporated into the price of oil, the energy cost savings estimated in this analysis would be significantly larger. The larger the energy cost savings, the larger are the positive ECITC economic and fiscal impacts.